DOCUMENT RESUME

ED 271 799 CS 505 315

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TITLE Applications of Microcomputers in Communication Teaching, Research and Administration.
PUB DATE Jun 86
NOTE 34p.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Computer Assisted Instruction; Computer Graphics; *Computer Oriented Programs; *Courseware; Databases; Educational Administration; *Educational Technology; Higher Education; *Microcomputers; *Speech Communication; *Technological Advancement; Word Processing

ABSTRACT

To help those who find themselves resisting microcomputers and those who have already made a decision to begin using the new technology, this paper summarizes the ways microcomputers can increase the flexibility, efficiency, impact, organization, information access, and creativity of those in the field of communication. Following an overview of the advantages of using microcomputers, the paper suggests specific applications for word processing programs, database management systems, spreadsheet software, graphics packages, communications software, and various utility programs. The paper concludes with a discussion of microcomputer limitations and an annotated list of recommended readings for those who need more information on the differences between various types of microcomputers. (HOD)

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APPLICATIONS OF MICROCOMPUTERS IN COMMUNICATION TEACHING, RESEARCH AND ADMINISTRATION

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Manuscript submitted to
The Virginia Communication Journal
June 1986

CS 505 315

APPLICATIONS OF MICROCOMPUTERS IN COMMUNICATION TEACHING, RESEARCH AND ADMINISTRATION

Abstract

The availability of relatively cheap, reliable, and powerful microcomputers has introduced a new dimension to the life of the communication professional. This essay summarizes the ways in which microcomputers can increase the flexibility, efficiency, impact, organization, information access, and creativity of those who teach, research, and/or administer in the field of communication. Specific applications are suggested for word processing programs, database management systems, spreadsheet software, graphics packages, communications software, and various utility programs. Limitations of microcomputers are discussed, and recommended readings are suggested for those who need more specific information on the differences between various types of microcomputers.

APPLICATIONS OF MICROCOMPUTERS IN COMMUNICATION TEACHING, RESEARCH AND ADMINISTRATION

INTRODUCTION

Before the advent of the personal computer, computer literacy was viewed as a complex and somewhat esoteric achievement, reserved for those with advanced technical degrees and late-night "hackers". Access to computers was severely restricted, and the knowledge needed to program them was gained only after long and tedious study. Today, the situation has changed radically. A massive revolution is currently under way which is affecting the way we teach, write, conduct research and perform a host of duties in the educational environment.

The introduction of relatively inexpensive, reliable and powerful microcomputers has literally placed computing power in the lap of today's teacher and scholar. Already most of those associated with a college or university have access to personal computers either at the office or at home (and in many cases both). Soon, using the microcomputer will be second nature to anyone associated with an educational environment. In spite of the inevitability of its almost universal adoption, use of the microcomputer is avoided or resisted by many who cling to their typewriters, roll books, accounting ledgers, file folders, address books, index cards, drafting boards, scissors and tape, etc.

The difficulty in making the change to new technology is rooted in several factors. First, there have been grossly overstated claims made by advertisers who would have the public

believe that microcomputers are capable of performing one's work while the user sips lemonade by the pool. As will be discussed later, microcomputers can perform many of the tedious tasks associated with the teaching profession, but this rarely results in increased leisure time. Second, the consumer is faced with hundreds of choices when it comes to purchasing microcomputer equipment and programs, and the task of knowing where to begin is intimidating and confusing. This task is managable, however, with the help of several currently available sources which are clear, readable, and provide the basic information one needs to begin. Third, individuals view the task of learning to work with microcomputers as constituting as significant investment of time that requires rearranging a major portion of their schedule. While it will be argued later that this fear has some basis in reality, it will also be argued that the integration of microcomputers into one's daily work is a gradual process that need not significantly disrupt one's daily activities and will very quickly become as natural as using a typewriter. Fourth, there is lack of concise, clear information on the various uses of microcomputers in the educational environment. This essay is designed to address this final point by discussing various applications in the areas of communication teaching, research, and administration.

The purpose of this essay is to help both those readers who find themselves resisting microcomputers and those who have already made a decision to begin utilizing the new technology. It is not designed to be a buyer's guide nor does it provide specific information on types and brands of microcomputers.

Rather, it is designed to illustrate the possibilities for applying microcomputers to the educational environment and to point the interested user in the appropriate direction.

Following a brief overview of the advantages of using microcomputers, specific applications will be suggested in each of the areas of teaching, research, and administration. Finally, the limitations of microcomputers will be discussed, and information sources will be recommended. Hopefully, this essay will help clear up some individuals' confusion surrounding the use of microcomputers and will provide a framework for others to take advantage of the potential resting on their desktops.

ADVANTAGES OF USING MICROCOMPUTERS

Flexibility.

With almost any kind of information, whether it is words, numbers or pictures, it becomes necessary to alter it at some point. If nothing else, mistakes are made in writing or typing words, entering numbers, or drawing lines; more importantly, information must often be changed or rearranged. Mistakes or changes can often be the most time-consuming task of completing one's work.

When revision, expansion, or correction of any type must be performed, microcomputers offer what is perhaps their most valuable service. The ability to change what you want whenever you want is one of the primary advantages of managing information with a computer. Microcomputers work with electronic images rather than directly with hard marks on paper, and thus they can be manipulated at will. Words, paragraphs, or even entire

documents can be inserted within another document; complex formulas can be recomputed automatically when one or more of the entered numbers needs to be changed; images comprising a picture can be moved to a different place (even enlarged or reduced) when changes need to be made. These changes can be made not only during the production process but even after a work has been completed. Because the electronic version of the document is available even after a hard copy has been printed, making changes on the video screen and then printing a new document requires minimal time and effort.

Efficiency.

One of the most frustrating dilemmas of the educational environment is that while the very nature of one's job demands a high degree of creativity, much of the work to be done involves mechanical tasks that leave less time for creative work. Adding to the burden is the fact that secretarial staff is in short supply. College and university instructors find that a large portion of their time is spent retyping course syllabi that change minimally from semester to semester, retyping entire exams when only a few items have been changed or added, writing letters to several people which contain the same basic information (such as requests for review copies of books or convention papers), entering exam scores into roll books and calculating grades, redesigning a transparency because a figure or model has been updated, or retyping a paper because it was rejected by one journal and the next possibility for submission requires a different style, writing a report to the department and then writing a similar report for the sponsoring agency. . . and so on

ad infinitum.

With the use of a microcomputer, the time consuming aspects of these tasks are reduced drastically. The essential elements of a report to one agency can easily be incorporated into a different report; manuscript style can easily be changed to meet the requirements of a different publication source; graphics can quickly be updated to incorporate current information; exams can be scored and entered into electronic grade sheets with calculations performed automatically; information to be used in several letters can be "boiler-plated" and effortlessly inserted into an endless number of letters; small changes can be painlessly made to exams and course syllabi. In short, the mechanical aspects of many tasks can be performed quickly and in many cases automatically, freeing the faculty member for more creative endeavors. This provides a measure of "self-sufficiency" that is invaluable for the overworked and undersupported educator.

Impact.

One of the facts of life in the teaching profession is insufficient time to fully implement one's ideas. Often attachments are omitted from proposals or reports because it would have taken too much time to produce the graph or chart. Small changes that might enhance the wording are rarely made to papers after they are finished because of the time involved in retyping them. The impact of slight changes in a financial report or proposal are usually not considered because of the time-consuming task of recalculating everything. Form letters

are usually sent to those on a mailing list because it would take too much time to type individual letters.

Microcomputers make it possible for one's work to have greater impact by facilitating such tasks as wording changes in documents, automatic production of charts and graphs, and "What if" projections with numbers. The decision to make the change that might make a difference is no longer a costly one. Many times the added touch of slight word changes is enough to enhance a paper's acceptance to a program or journal; additions of graphic information make one's presentation clearer and more understandable; decision-making is almost always improved by the ability to consider alternatives; and letters will usually command more attention when addressed to specific individuals and containing information specific to them. The microcomputer expands one's persuasive abilities.

Organization.

One of the most frustrating tasks facing today's educator is dealing with the increased amount of information necessary for teaching and writing. Class sizes are increasing; convention papers collect year after year without being properly filed; quotes and references for writing accumulate faster and faster, demanding continuous shuffling; budgets for grants and projects are increasingly complex; committee reports are called for on an increasing basis. How is one to go about organizing such large quantities of information? Frequently, the necessary organization never takes place, and when something is needed, much time is wasted just trying to locate a piece of information.

The microcomputer provides the ideal aid in developing a

system for organizing such information as notes, references for books and papers, figures and rationales for budgets and proposals, etc. Database management software allows simple and fast entry of almost any type of data, with continuous updating and countless possibilities for sorting and rearranging. By utilizing the power afforded by electronic manipulation, effective organization becomes a reality rather than a postponed monster.

Access to Information.

For the teacher or researcher, much time is spent tracking down information. From trips to the library to searching through file folders, a significant portion of the teaching and research process is actually locating and obtaining the information necessary to do one's job. Hours can be spent traveling to various library sites or writing letters requesting others to send materials, and then more time is needed to copy the needed information and eventually transfer it to the lecture notes or manuscript or, in the case of numerical data, to the university mainframe computer for statistical analysis.

While the era of full electronic access to information is still a few years away, it is presently possible to perform many of the search and locate tasks from the convenience of one's home or office with the help of a microcomputer. Many libraries have computerized their card catalogues and made them available to registered users with a microcomputer and modem. Electronic data banks exist from which it is possible to search for specific information or even download entire files for a small fee. These

files can be sent to a mainframe computer or else analyzed on one's own microcomputer (unless the data set is extremely large). The time will come soon when most of the printed material in a library will be stored electronically and accessible in the same manner as statistical data banks are today. When this service becomes a reality the entire process of taking notes will be transformed. No longer will one need to copy notes from an original source and then transfer them into one's working document; rather it will be possible to electronically excerpt notes and place them directly into a document with no rekeying of information. Several news services currently offer up-to-date information in this manner, and as soon as the price for such service goes down it will become an attractive alternative for use in journalism classes.

Creativity.

While the primary benefits of using a microcomputer rest on its ability to perform the mechanical aspects of a task, the important side benefit of such assistance is the enhancement of creativity. Quite simply, the freedom of not having to worry about making mistakes and the ease with which one's work can be altered remove a wide array of blocks to creativity and open a wide vista of opportunities for new ideas to develop. A single example should sufficiently illustrate the point. Probably the most significant block for most writers is the thinking that every sentence (or even word) must be in perfect form before it reaches the paper. The problem for most writers is not thinking of something to say; rather it is thinking of the perfect thing to say before "committing" it to paper. This is appropriately

known as "writer's block," and it plagues a high percentage of those in the educational environment.

The microcomputer provides the ideal solution to this malady. Once one becomes accustomed to the ease with which changes can be made, one no longer views putting down one's ideas as a "commitment." It becomes easier to test ideas, play out images which come to mind while working, or express tentative, often fleeting feelings. Almost all theories of creativity emphasize the need to write down anything and everything that comes to mind and reserve the editing process for a later time. Microcomputers will not provide the creative ideas for the user, but they do remove many of the hindrances to creative thinking.

APPLICATIONS OF MICROCOMPUTERS TO TEACHING, RESEARCH AND ADMINISTRATIVE DUTIES

The microcomputer by itself is basically a helpless, sleeping giant. It can operate only if it is told what to do. Unfortunately it does not understand any of the human languages such as English, Spanish, or even Greek. Fortunately, on the other hand, humans have developed languages which the microcomputer can understand. These languages go by such names as BASIC, PASCAL, LISP, C, FORTRAN, and COBOL. These languages allow humans to "program" the computer by issuing "commands" to perform various tasks. The drawback of these languages is that they are difficult to learn and cumbersome to use for the typical microcomputer user. However, the user of today's microcomputer rarely has need to learn any of the specialized languages understood by the computer, because higher-level programs have

been developed which have a more simplified command structure but which utilize these more difficult to understand languages to perform certain tasks. The most common programs for the microcomputer can be categorized under word processing programs, Database management systems, spreadsheet applications, graphics software, communications packages, and various utilities. This section will examine each of these categories and explore their applications to teaching, research, and administration.

Word processing

Even though the computer was originally developed in order to process numbers for accounting and statistical purposes, the most common use for the microcomputer is probably word processing. For anyone who writes more than one page of prose per day, whether in the form of a letter, a lecture or a report, the word processing capability of the microcomputer can significantly enhance the writing process.

Word processing removes much of the linear nature of writing, in which manuscripts usually move from the first iteration to the second draft to the final copy. With the microcomputer, writing evolves more organically, thus making the writing process more congruent with natural thinking processes. This is possible because of basic operations such as the word processor's ability to insert and delete text with immediate reformatting, its capacity to copy and move blocks of text of almost any size, its capability of importing blocks of text from another file, its power to search and replace strings of text. Beyond these basic operations, many word processors also provide

spelling checkers, an electronic Thesaurus, style checkers, and automatic indexing, table of contents and bibliography. With many of the newer word processing programs it is possible to work with more than one document at the time and to easily exchange information between the two. Form letters can quickly be processed through mail-merge capabilities, where a list of names and addresses stored in one file can be merged with a single document skeleton to produce a large number of individually addressed letters containing the same basic information.

In the area of <u>teaching</u> the most immediate application of word processing is for the preparation of lecture material. Lecture material is usually gathered from several sources and later integrated in outline form. Under normal circumstances the "integration" takes place in the form of cut-and-paste with scissors and staples. Word processing makes it possible to gather information in any order and then easily arrange it in the required order through electronic cut-and-paste operations. With automatic outline development features of many word processing programs, when the lecture is finished an outline (perhaps with definitions of key terms) can be generated and xeroxed onto a transparency for use in class with an overhead projector. The increased organization and the ability to provide students with a lecture outline enhances the instructor's effectiveness and credibility.

Not only does word processing made it easier to initially enter and arrange the information, but it makes possible continuous updating and rearranging. It is an all too common occurrence that teachers use the same set of notes over and over

semester after semester, even when the information and examples are outdated. This is usually blamed on the lack of time to find the new information, but it is probably more related to the lack of time to incorporate the new information as it is found. Word processing will not find new information for the instructor, but it does provide a way for the new facts and examples to be painlessly incorporated into the old lecture and for the old information to be deleted (or stored in a separate file for the sake of record-keeping). This updating makes for higher quality teaching and more interesting classes.

In addition to transforming the lecture preparation process, word processing can also play an important role in providing students with feedback on class assignments and papers. Most instructors would like to provide more detailed feedback, but it is a time-consuming process which usually receives low priority. Fortunately (or unfortunately perhaps), students seem more interested in receiving a grade than in receiving detailed feedback, and so instructors continue to neglect this aspect of their teaching. Word processing, through its mail-merge capability, is able to assist in the feedback process in a significant manner. By developing a file of the most common criticisms and suggestions for improvement associated with a given assignment, the instructor can simply enter keywords and extract the appropriate statements for individual students. In this way, individualized and detailed feedback can be provided with a minimum of effort. This ability increases both the likelihood that the instructors will provide feedback and the usefulness of that feedback to the student.

In the area of research, word processing programs also offer many applications. The most obvious use is for the preparation of scholarly manuscripts. Many word processing programs now include or can be used with "thought processing" programs, which provide a tremendous aid in organizing one's ideas. Basically, these programs allow the researcher to take notes from source materials much as one would normally do on paper notecards. As one develops an outline for the paper, these notes can be identified with a number linking them to one or more sections of the manuscript. At any point the researcher wishes, these notes can be automatically placed in their proper location within the outline with no retyping required, and without even the cut-and-paste operations necessary in normal word processing programs. Rearrangement of the outline is possible at any time. Of course these same notes can be used in other documents, and they can be filed in a database system (see below) to provide an information bank for future research projects. This saves much duplication of effort as one moves from one research project to another.

The application of word processing programs to the administrative duties of the educator are also numerous. Memos, reports, and letters are basic facts of life for the college or university instructor. The microcomputer not only offers the writer greater flexibility in writing and making changes, but perhaps more importantly it allows the writer to develop a basic form containing standard information used for particular types of memos, reports or letters, and then to incorporate any unique information into that standard form. For example, the tedious task of writing letters of recommendation for students can be

simplified by developing a standard letter that would be applicable to most recommendations and then simply adding a few lines applicable to a particular student. Using mailmerge capabilities of most word processors, such tasks as requesting convention papers or article reprints from authors can be simplified by developing a standard form and then merging it with a data file containing the author's address and the title of the paper along with any other unique information (such as the name and date of the convention). Report writing becomes less time consuming when much of the information can be pulled from files which were created earlier for other purposes and incorporated into the text of the document with only minor changes. The possibilities are endless for using word processing to assist with administrative duties.

The value of word processing is particular important for the faculty member who lacks the secretarial support offered to those in similar positions in large organizations in the business sector. It allows the writer to concentrate on creating the manuscript,rather than on the tedious tasks of entering, changing, moving, and deleting information.

Database Management

A data base is nothing more than a collection of useful information organized in a specific manner. For example, a recipe file on index cards arranged by type of meal is a data base maintained in many homes. Almost every house or office contains a commonly used data base called a telephone directory, usually organized alphabetically or alternatively by area code. Database Management Systems (DBMS) have been used in the business

environment for many years to store and manipulate large collections of data, including payroll records, accounts receivable, mailing lists and inventories.

In the educational environment, DBMS can be used for a diversity of tasks. Teachers can maintain a "bank" of exam items, from which they can extract a subset for a particular exam. Researchers can construct and maintain extensive bibliographies of their collected papers, books and references which they can update at any time and from which they can extract those being used in any particular paper or project. By including notes with each reference, the old system of notecards can be discarded in favor of a highly flexible and efficient database of quotes and notes. Administrators can keep files on personnel and purchases, and they can maintain mailing lists for a variety of purposes (such as current students, alumni or journal subscribers).

There are four primary functions served by database management systems:

1. **Data Maintenance** - This involves adding information to the database, changing some or all of the contents, and deleting items from the database. New records can be inserted and any item can be modified or replaced.

2. **Location and Retrieval of Information** - Items stored in a database are given a record number and a field name. Any item can be located by its record number, or all items corresponding to a particular field name can be requested.

3. **Sorting and Rearranging** - Records in a computerized database can be automatically sorted into a predetermined sequence or order, either alphabetically (for example, by last name) or numerically (for example, by Zip Code).

4. **Linking Elements of Different Files** - While simpler DBMS will not perform this function, more powerful relational database computer programs allow the user to link files containing the same item but which otherwise contains different information about that item. For example, a student records Database might contain two different files. One file might contain all students' academic transcripts while the other contains demographic records on all students. If the user wished to establish a list containing students' racial background and their respective GPA's, it would be possible with a relational database to extract the racial background information from one file and the GPA's from the other file and combine them into another file or into a report.

Until recently the use of DBMS required a mainframe computer, which only larger organizations could afford. The development of database software for the microcomputer has not only made it possible for more businesses to computerize their records, but it has also opened new possibilities for those in the educational environment.

Spreadsheets

A computer spreadsheet is laid out much like an accountant's pad. It contains rows and columns into which one can enter data

and then produce sums and totals, among other figures, for use in keeping track of one's financial or numerical records. Businesses use such accounting procedures for keeping track of payroll accounts and for specialized functions, such as processing banking records. In replacing the traditional financial modeling tools (the accountant's columnar pad, pencil, and calculator), spreadsheet programs are to those tools what word processors are to typewriters.

An electronic spreadsheet can do much more than simply sum figures, however. It can perform complex arithmetic operations which otherwise would require hours with a calculator or pages of computer code written in general computer languages such as BASIC, because the columnar pad of the spreadsheet exists in the dynamic memory of the computer rather than on static paper. This allows the electronic spreadsheet to be much larger than any managable paper pad (the typical spreadsheet has around 2000 rows and over 200 columns), and it offers dramatic improvements in the ease with which one can create, edit, and process data. Once a model has been developed for a spreadsheet, the simple entry of data will result in automatic production of calculated results. Any additions or changes will result in automatic updating of previously calculated results.

The use of spreadsheets is immediate in several areas. A teacher can design, for example, a gradesheet for a large class where there are several assignments, each with a different weight attached. The student's final grade will be computed automatically each time the results of an assignment are entered, and changes can be made to a student's grade without having to go

through a series of tedious calculations. With research budgets established on a spreadsheet, minimal effort is needed to produce figures for a number of different proposals. Once a basic structure has been established, costs can be changed and the entire worksheet will be updated. Departmental budgets can also be treated in a similar fashion. Records can be kept of student evaluations, allowing easy comparison across different instructors or different courses. Expense report forms can be built which require the entry of only a few numbers following a trip. In many cases, it is not even necessary to build these spreadsheets oneself; rather templates can be purchased to work directly with the spreadsheet software.

Perhaps the most exciting feature of electronic spreadsheets is that it allows the user to develop a model containing a set of mathematical relationships and then perform extensive "what if" analysis. This allows one to test the effects of different assumptions on a specified end result. All that is required is the entry of the single number along with a couple of keystrokes. The computer is able to do the remainder almost instantaneously with most models, and it will not make an error in calculation. With a pencil, paper pad and calculator in hand, every change to the model requires recalculating every relationship in it. For example, suppose a department chair had build a model of the next year's budget with the assumption of a 5% increasing in operating funds. If she wished to see the effects of a 10% increase (or more likely zero increase!) on the amount of money available for each aspect of the budget (xeroxing costs, new equipment purchases, travel, etc.), the only new entry required would be

the replacement of the 5% figure with the 10% figure. The same power would be available to a teacher who wished to know what a particular student needed to make on the final exam in order to pass the course.

Most of the recent spreadsheet packages include the ability to automatically construct graphs from the data contained in the worksheet and to perform limited data management functions. In addition, simple statistical calculations can also be performed. With or without these features, spreadsheets offer the user tremendous assistance in developing budgets, maintaining grade books, and developing research proposals. Overall, the development of spreadsheet software for the microcomputer provides a entirely new approach to working with numerical and financial data and corresponding calculations.

Graphics

From their very beginning microcomputers have offered the user excellent graphics capabilities, exceeding that of most large mainframe computers. Interestingly, the development of graphics for the microcomputer market can probably be traced to the early interest in video games. Consumers' demand for such games as "Flight Simulator" and "Space Invaders" provided impetus for the microcomputer to offer graphics capabilities. The use of graphics is certainly not limited, however, to playing computer games. For the educational environment, there are two types of graphics programs which provide assistance to faculty members.

One type of graphics software is commonly referred to as "business graphics" or "statistical graphics". These programs

are able to automatically construct (i.e., scale and format) graphs such as pie charts and line or bar charts from the numbers which are entered into a table. These are usually very high precision graphs, and they appear almost instantly on the screen. Leading spreadsheets and statistical programs now incorporate these as part of their overall package. They offer the user tremendous ability to discover and to present relationships among various data that would have formerly been possible only with hours of painstakingly slow manual labor. Furthermore, as is the case with spreadsheets in general, the user can determine the effects on a graph of changing one or more of the numbers associated with it. For example, it is possible to visually illustrate (through a line or bar chart) the change in discrepancy between one's departmental faculty salaries and the university average salary. The effects of various changes in this discrepancy brought about by varying the amount of money provided the department for the coming year can be quickly and easily illustrated. This capability allows one to present a more powerful and compelling argument for additional monies.

The other type of graphics software works much like freehand drawing, except that the image is stored electronically and can be manipulated by the user. Images are created by using the cursor arrows of the microcomputer keyboard (or other pointing or tracing devices, such a mouse or a lightpen) to draw a picture on the video screen. Most graphics packages of this type allow certain standard images such as circles and rectangles to be constructed by simply defining their boundaries. They also provide for text entry by using the standard keyboard. Once

drawn on the screen, these images can usually be enlarged or decreased in size, can be inverted or rotated, and can be moved or copied. They can also be "shaded" to represent different colors, or with a color monitor the colors themselves can be displayed. Images created for one graphic can be stored in a separate file and used later in another graphic. Some programs even allow simple animation. With most newer graphics packages, images can be sequenced and then displayed on the computer screen much like a "slide show."

Combined, these two types of microcomputer graphics offer the teacher/scholar a wide range of possibilities for enhancing lecture presentations, research reports, and event advertising. They allow the average individual with no formal art training to produce quality, attractive graphics. Teachers can create attractive and informative overhead transparencies; researchers can construct precise and detailed data summaries; administrative reports can contain revealing charts and graphs; and almost anyone can construct attractive flyers to announce new classes, special programs or other events. Graphics can even be transferred to videotape for use in video productions. Without the microcomputer, the high costs of having any of the above produced by an artist would usually prevent their use.

Communications

With a modulator-demodulator (MODEM) and appropriate software, a microcomputer can communicate with either a larger mainframe computer or with other micros, which might be located in the same building or halfway around with the world. The modem is able to convert the digital information of the computer into a

series of tones that can be transferred over a phone line to another computer with a modem which converts the analog tones back into digital signals usable by that computer. This allows the microcomputer to transfer files to and from another microcomputer, and it makes possible information exchange with a larger mainframe computer. The micro can even be used to "emulate" a mainframe terminal and thereby directly access the more powerful programs available only on larger systems.

The importance of communications capabilities are probably less than obvious to even many experienced computer users. However, the possibilities for academics are exciting. Teachers can hold electronic "office hours" with students sending them messages to their electronic "mail box." Replies can be directed to the inquiries in a similar fashion on most campuses via an electronic mail system available to students through a campus network. Even critiques of student papers and exam results can be "handed back" to students electronically rather than taking up valuable class time. The use of such electronic mail can be invaluable when the faculty member does a great deal of work off campus or when classes meet once-a-week at night and are mainly populated with working adults who have difficulty coming to campus during normal working hours.

In the area of research, the existence of on-line databases makes a large amount of remote information available without leaving one's office chair. These databases generally contain either bibliographic entries or statistical data. There are literally hundreds of bibliographic databases currently available, including the entire Library of Congress catalog, an

electronic version of Books in Print and indexes to thousands of periodicals. Using the keyboard of one's personal computer, searches can be conducted for specific works or using keywords describing the subject matter. The bibliographic information can be "captured" on a disk and/or sent to a printer. In many cases one can even order hardcopy of particular articles. Increasingly, libraries are putting their "card catalog" on disk and making it available through terminals located in campus offices. This allows the faculty member to "browse the stacks" from the convenience of their office.

For those researchers who work collaboratively with colleagues at other universities, electronic communications can revolutionize the notion of joint authorship. Instead of exchanging drafts of manuscripts by mail, documents can be exchanged through the telephone lines. The receiver of a document can use a word processor to make additions and/or changes and then send the document back to the other person who can respond during the same day or even the same hour. The same type of information exchange can occur with research data. One member of the research team might code the data and then send it to the other for analysis.

Much of one's administrative communications can also be conducted electronically. While most people use the telephone to send and receive messages which demand immediate attention, much time is wasted making connections with busy individuals. It is common that three or four returned phone calls are needed to finally reach the other party. Electronic mail allows the communication of information while it is fresh on one's mind.

Messages can be sent to a particular individual through the system mailbox, where it can be available whenever the other has has the opportunity to receive it. The message can be relatively short (such as a meeting notification), or it can be lengthy (such as the text of a report). The advantages are that the sender can immediately "cross it off the list" of things to do, and the receiver has a record of the "conversation" which can be printed or sent to the appropriate electronic file. This same process can be used for intra- or intercampus communications.

Many other possibilities for the use of electronic communications exist, such as computer conferencing, placing orders for supplies and equipment, filing government forms with appropriate agency offices, buying stocks, making airline reservations and even receiving specialized news. Once the basic equipment and software is purchased and installed correctly, it can be used for a number of purposes. Electronic communication is an area of microcomputer use which will increase sharply in the next few years.

Miscellaneous Utilities

There are several types of microcomputer programs which lie outside of the five general areas discussed above and which can enhance the work of the teacher/scholar. Three types of software are particularly useful for educators. Test analysis programs allow the teacher to subject any objective exam to a detailed item analysis. Answers of students recorded on standard Scan-Tron forms can be scanned directly into a computer file and then analyzed to determine the overall difficulty and validity of each

individual exam item. This provides invaluable assistance to the teacher in monitoring and improving exams. Project manager programs allow the researcher to develop a master plan for major projects. Specific tasks and target dates can be established, with detailed plans developed for carrying out each step of the project. This can be of tremendous help when trying to communicate to project assistants a specific plan of action. Content analysis programs provide assistance in coding and analyzing qualitative research data. These programs allow the researcher to assign codes to sections of text (from interviews, for example) and then to quickly find and sort the data according to a specified scheme. Finally, computer assisted instruction (CAI), which has previously been available only on the mainframe, is now more commonly used with microcomputers. Simple authoring programs exist which allow the teacher to construct exercises and tutoring sessions for students which are self-administered. Once developed, these sessions can promote significant self-directed learning on the part of the student.

There are literally hundreds of utility programs available for microcomputer users. User groups have been created to freely share many of these programs, and one is almost surely to find a program which will provide assistance in specialized applications. New products are being developed daily, and the educational market is only now receiving serious consideration by programmers and software specialists. The future looks bright in this area.

A NOTE ON LIMITATIONS OF MICROCOMPUTERS

While this essay has extolled the many virtues of using microcomputers in teaching, research and administrative duties, it is misleading to conclude without addressing limitations associated with such applications. In the first place, one is limited by the software and hardware available for one's personal use. In many cases this is not a problem, as the majority of schools and universities have made significant investments in microcomputer equipment and programs during the past few years. However, if it is not available through one's college or university, the initial costs of purchasing a system is quite high, although prices are dropping significantly. Even when the school has installed a large number of microcomputers, if they are not conveniently located the faculty member will be unlikely to make largescale use of them. A microcomputer needs to be located on one's desktop or at least next door in a well-designed work area.

Second, the microcomputer user is constantly faced with changing technology. New developments occur almost daily, and what was yesterday's "state-of-the-art" is almost obsolete today. In addition, perhaps more than any other product area, the microcomputer industry truly responds to the market. The needs of consumers are fed back to the developers at an amazing rate, and changes constantly occur to meet consumer demands for new products and new applications. The saving factor for the user is that even though a product may be "outdated," it still "works" for the person using it. In addition, changes tend to build on the established market, not replace it, and so most purchases can

be easily "upgraded." The same is true with the expertise one gains in working with a particular program. One's microcomputer knowledge is never useless in the face of changes. Rather, any new developments will utilize the same basic principles of the old. Of course, exceptions will occur, and in any case the microcomputer use must be willing to constantly learn and grow as the market develops and expands.

Third, while it takes almost no time to get "up and going" with most software programs, it does take a significant amount of time to master any program. One can quickly increase personal productivity, but it requires late nights in front of the screen and endless sharing of ideas to fully computerize one's work. Contrary to the myth that computers provide the user with more free time, the enthusiast is likely to <u>increase</u> the amount of time on the job; the payoff is that one will be able to do more and will be able to produce higher quality work. Nevertheless, the time investment is a variable not to be taken lightly.

Finally, the computer can only work with the information provided. It cannot create information for the user. The ability to utilize software such as database packages is directly linked to the amount of time spent entering information. As beautifully as graphics packages are able to construct charts, they can only work with the numbers provided. As efficiently as work processors and thought processors can help arrange text, the quality of the ideas depend completely on the user. The microcomputer can <u>enhance</u> the user's creativity and productivity, but it cannot actually create or produce without input.

RECOMMENDED READINGS

This essay has not attempted to distinguish between different makes and types of microcomputers, nor has it discussed different types of operating systems or specific software programs. The technology and the market are constantly changing, and by the time this essay appears in article form any information of this type would be outdated. The listed books below by Brownell (1985) and Schrodt (1984) are very useful in describing the different types of microcomputer systems available.

Once one possesses a minimum of basic information on the microcomputer, it is advisable to seek the opinions of friends who own microcomputers. Experienced users are usually the best sources of information regarding performance of various systems and advantages of particular types of software. When one has purchased a microcomputer system and software, the best sources of information for learning the operating system and software (in addition to the manuals which accompany the software) are various books available in the major bookstores. In addition, there are several monthly or quarterly magazines which provide up-to-date information on changes in the market and on new software developments, which and print numerous hints and tips on product use.

The following books and magazines are recommended:

Brownell, B. A. (1985) **Using microcomputers: A guidebook for writers, teachers, and researchers in the social sciences.** Beverly Hills, CA: Sage Publications.

Although any book on microcomputers is out-of-date the moment it is published, this paperback provides a thorough examination of the most popular microcomputers and their operating systems. More importantly, it introduces the basic concepts of word processing, database management, spreadsheet applications, and communications. Additionally, it reviews several software packages under each category, and it provides specific examples of their applications. It is clearly written and appropriate for both the beginner and for those who are already started and want to learn more.

McWilliams, P. J. (1982) **The Word Processing Book.** Los Angeles: Prelude Press.

Although its software reviews are a bit out-dated, anyone with any lingering doubts about the utility of word processors will be fully convinced of the need to make the switch after reading this highly informative and entertaining book. The author reviews several word processing packages and also discusses several brands of microcomputers, many of which are no longer manufactured. Specific applications are described for writers, students, and the self-employed.

Personal Computing. P.O. Box 2914, Boulder, Colorado 80321. (Monthly, $12/year subscription; $36/year newsstand)

In order to make full use of the computing power available to the microcomputer user, it is almost imperative that the user subscribe to one of the many available periodicals.

They help the microcomputer user keep abreast of changes and new developments in the marketplace, and they provide many valuable hints and tips for performing one's work. Although there are a large number of monthly or quarterly periodicals which provide this type of information, most of the others are either oriented toward users of a particular type of microcomputer (IBM, Apple, Commodore, etc.), or else they are a bit too technical for the beginner or even the intermediate user. Personal Computing is a monthly magazine which is written in layperson's terms. While it follows the lead of most of the other top microcomputer magazines and orients most of its feature articles to the business world, it is more suitable for the educational market than most of the others.

Schrodt, P. A. (1984) **Microcomputer methods for social scientists.** Beverly Hills, CA: Sage Publications.

This small paperback is part of the Sage series on "Quantitative Applications in the Social Sciences," and it is therefore more oriented toward those dealing with quantitative applications. Nevertheless, it provides one of the best overall introductions to the language and concepts of microcomputing for the beginner. It provides a good overview of what micros can and cannot do, and it describes the various components of a computer system and how it works. It contains specific chapters on editors and word processing, programming (BASIC, PASCAL, etc.), statistics and numerical programs, database management systems, and

graphics. In addition, it leaves the reader with an annotated bibliography, although it seems oriented toward the programmer rather than the more inexperienced user.

Social Science Micro Review. Link 106, North Carolina State University, Raleigh, NC 27650. (Quarterly, $30/year)

For those who teach with a social science emphasis, this is an excellent periodical. It is devoted exclusively to social science computing, and each issue includes a software disk. It is published quarterly.